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ORTHOPTEROLOGIC FAUNA OF OUARGLA OASIS

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ABSTRACT

Orthopterologic populating study has been conducted in 3 stations of Ouargla Oasis situated in south-west of Algeria. Orthopteras Samplings are realized every fortnight from September 2001 until August 2002. This inventory is completed by floristic statements for each station. 18 orthopteras species were inventoried with 16 Caeliferae where 14 belong to family of Acrididaes and so 2 species of Ensiferae belonging to Gryllidae family. Study of total and middle richness shows variation according to stations and to samplings periods. The most important yearly centesimal frequency is pronounced for *Pyrgomorpha cognata* specie in both palm groves, and for *Acrotylus patruelis* specie in the cultivated ground of Experimental farm. of Hassi Ben Abdullah. Constancy of Orthopterologic species varies from station to another. However, two species are constant for the three stations, which are *Pyrgomorpha cognata* and *Ochrilidia gracilis*. The most important diversity index is 1.66 bits in June month for Mekhadma station. Equitability values are all closer of 1. corresponding to populations in balance between them. The contagious distribution of individuals is the most characteristic. Through factorial analysis of correspondences, we have noted that orthopterologic species are spreading according to their ecologic affinities

KEYWORDS: Inventory, Orthopteras, Oasis, Ouargla

INTRODUCTION

Since several centuries, damages caused by harmful insects have paid high attention. Acrididae are probably the most dreadful. Every year, acrididae-locusts cause to cultures important devastations (DOUMANDJI – MITICHE and al 1993).Yes, millions of persons died by hunger because of those insects, several others suffered by starving, whole regions had been deserted (APPERT and DEUSE 1982). Supervision and mastery of that acrididae problem assume a serious knowledge of biology and ecology of those insects. Those allow discovering the most vulnerable phase of insects to be fought in order to undertake an economic struggle. Through that database giving evidence of danger caused by those acrididae, several works were carried out all of the world and in Algeria. We quote among others those of CHOPARD (1938, 1943, 1951). DIRSH (1965), LECOQ (1988), LAUNOIS and LECOQ (1989), SLIACKA and al (2013), DOUMANDJI and al (1991.1992; 1993); DOUMANDJI – MITICHE and al (1993 – 1999), BELHADJ an DOUMANDJI-MITICHE (2004, 2011) GHENDOUZ-BENRIMA and al (2011), and BELHADJ (2013). Those studies have developed several aspects which are: systematic, biology, ecology, diet and struggle. This present study is looking for some knowledge relating to biology and ecology of orthopterologic populating of the chosen stations in Ouargla Oasis.

METHODOLOGY

Oasis of Ouargla is situated in saharian bioclimatic stage with soft winter. Our samplings were realized in three stations, a modern palm grove of Upper Training National Institute of Saharian Agronomy (U T N I SA). The traditional palm grove of Mekhadma and experimental farm station of Hassi Ben Abdallah.

- **Station 1 (S1)** Modern palm grove of Upper Training National Institute of Saharian Agronomy (U T N I S A) Its altitude is 132m exposed to South-West. The ground is occupied only by date palm and by spontaneous plants. We quote among of the most spread: *Cynodon dactylon, Medicago hispida* and *Franckenia pelverulenta*. The whole covering is 45.82% with 39.86% relating to *Phoenix dactylefera*.

- **Station 2 (S2)** Traditional palm grove of Mekhadma.

This is a traditional palm grove characterized by a plantation's homogeneity. Distance between date palms is regular varying between 2 and 10 m. Altitude is 134 m exposed to North-West. The ground is occupied by two stratums, stratum marked by date palm and another by adventitious plants. Spontaneous vegetation is typical of those salted grounds, it exists usually *Spergularia saliona* and *Melilotus indica*. The whole covering is 57.78% with 50.94% occupied by *Spergularia saliona* and *Melilotus indica*.

- **Station 3 (S3)** Experimental farm of Hassi Ben Abdallah

It is situated at altitude of 175 m exposed to East-West. Practised culture is *Allium cepa*. However, multitude of adventitious plants is growing. Global covering rate is 18.76% with 10.10% corresponding to *Allium cepa*.

The sampling aim is to obtain from an area as restricted as possible, a faithful picture of the whole populating (LAMOTTE and BOURLIERE 1969). Thus, it is necessary to gather samples as representative as possible of the stations' fauna where we are working (VOISIN 1980). We used methods of quadrates. This method principle is to count number of present individuals on a determined area to obtain satisfactory valuation of population diversity (BARBAULT 1981). Five samplings were realized inside of each station, into squares of $9m^2$ giving 3 m side, delimited by a string of 12 m length. Squares site is random. Goings-out are made early in the morning in the moment where locusts are numb, those which escape from sampling area are captured with mower net. Quadrates were realized once fortnight during all experimentation period going from September 2001 until August 2002.

In laboratory, samples of orthopteras intended for collection are killed in flask containing cotton pad saturated with ethyl acetate. As for determination of orthopteras species, we used binocular magnifying glass allowing observing different morphologic criteria. Systematic determination of orthopteras species is made with help of Orthopteroids' key of North Africa CHOPARD (1943). Inventory of orthopteras species were so done in the three studies' stations.

According to AMEDEGNATO and DESCAMPT (1980), a locust populating may be definite by various parameters where main ones are diversity, specific richness, density and spatial distribution of individuals, so as manner by which species spectre is organized, the whole is result of interactions exerting between species and their environment. Obtained results are exploited with help of composition indexes with total richness (S) that corresponds according to RAMADE (1984) to total number of all species observed during of N statements. The average richness which is average number of present species in a biotope sample where area has been arbitrarily fixed $Rs=\sum S / N$ where Rs is specific average richness. N is statements number. S is total richness, centesimal frequency which is the rate of individuals of a

specie i taken in consideration according to total individuals all species confounded (DAJOZ 1971) F%= ni×100 /N where ni is individuals number of specie is taken in consideration. N is total number of individuals of all confounded species and constancy C which is the expressed report under rate shape of statements number containing studied specie to total number of statements effected (DAJOZ 1971) C=P×100 /R. It allows saying if a specie is constant, accessory or accidental. P is number of statements containing studied specie. R is number of statements effected...Also il is taken into account structure index where diversity index of Shannon-Weaver (H) which is most usually used (FRONTIER.1982). It derives from theory of information H' = - $\sum$ qi $\log_2$ qi where H' is expressed in bits and qi relative frequency of specie i taken in consideration. Equitability index (E) is the report of observed diversity (H') to maximal diversity (H'max) (BLONDEL 1979). Maximal diversity is given by formula: H' max = $\log_2 S$ where S is the total richness (WEESIE and BELEMSOBGO.1997). Equitability varies between 0 and 1. Individuals which constitute a population may present various types of distribution (DAJOX.1971).

Knowledge of distribution mode is useful when we like to valuate population density by sampling. We must calculate variance S^2 which is given by the following formula $S^2=\sum(X-m)^2/ N-1$ where N is the whole of sampling, m is average number of individuals in each sampling, X is individuals number of each sampling. When $S^2= 0$ distribution is uniform, if $S^2 < m$ distribution is regular, $S^2= m$ distribution is random, $S^2 > m$ distribution is contagious. Furthermore, factorial analysis of correspondences is used as statistic method; It aims to gather in one or several graphs, the possible largest part of information (LEBART and al 1982).

According to DAGET (1976), graphic observation may give idea on interpreting of factors and showing which variables are responsible of closeness between on such and such observation.

RESULTS

Inventory of orthopteras species gathered from our samplings in the three stations in Ouargla Oasis, shows that the last one shelters 16 species of Caeliferae and 2 Ensiferae. Sub-order of Caeliferae presents 3 families, Acrididae family seems to be the most important with 6 sub-families, when both other are represented only by one each specie *Pyrgomorpha cognata* and *Paratettix meridionalis,* respectfully 5 species of Orthopteras are common to three stations which are : *Pyrgomorpha cognata, Aiolopus thalassinus, Duroniella lucasi, Acrotylus patruelis* and *Ochrilidia gracilis.* Some species are present only at level of date groves, as *Aiolopus strepens* and *Paratettix meridionalis.* Others species are pointed out only in station of Hassi Ben Abdallah, which are *Acrida turrita, Truxalis nasuta* and *Ochrilidia surcouffi*: Besides, family of Gryllidae is existing at level of palm groves with *Gryllus bimaculatus* and *Gryllulus palmetorum* (Table 1).

Table 1: Inventory of Orthopteras Species Counted in the Three Study Stations of Ouargla Oasis

Sub-Order	Families	Sub-Families	Orthopteras Species	S1	S2	S3
Ensifera	Gryllidae	Gryllinae	*Gryllus bimaculatus* (Degeer, 1773)	-	+	-
			Gryllulus palmetorum (Krauss, 1902)	+	-	-
	Pyrgomorphidae	Pyrgomorphinae	*Pyrgomorpha cognata* (Krauss, 1877)	+	+	+
Caelifera	Acrididae	Eyprepocnemidinae	*Hecteracris annulosus* (Walker, 1870)	+	-	-
		Cyrtacanthacridinae	*Schistocerca gregaria* (Forskal, 1775)	+	-	-
			Anacridium aegyptium (Linné, 1764)	+	-	-
		Acridinae	*Acrida turrita* (Linné, 1758)	-	-	+
			Aiolopus strepens (Latreille, 1804)	+	+	-
			Aiolopus thalassinus (Fabricius,	+	+	+

			1781)			
			Duroniella lucasi (Bolivar, 1881)	+	+	+
		Oedipodinae	*Acrotylus patruelis* (Herrich-shaeffer, 1838)	+	+	+
			Sphingonotus rubescens (Walker, 1870)	+	-	-
			Sphingonotus carinatus (Saussure, 1888)	+	-	+
		Gomphocerinae	*Ochrilidia surcoufi* (Chopard, 1936)	-	-	+
			Ochrilidia gracilis (Krauss, 1902)	+	+	+
			Ochrilidia kraussi (Bolivar, 1913)	+	-	+
		Truxalinae	*Truxalis nasuta* (Linné, 1758)	-	-	+
	Acrydiidae	Acrydiinae	*Paratettix meridionalis* (Rambur, 1839)	+	+	-

-: Absence of the species :+ Presence of the species

Total richness recorded for the three study stations, are of 14 species concerning station of U T N I S A., 8 species for station of Mekhadma and 10 species for experimental farm station of Hassi Ben Abdallah figure 1. Those fluctuations are due to the difference of applied behaviours to palm groves and to microclimate which characterises every station. Effectively, shade effect which is very pronounced, palm trees being too tight in the traditional palm grove of Mekhadma, disadvantages diversification of fauna orthopteras-species. On the other hand, modern palm grove of U T N I S A. presents a higher total richness; this last one is irrigated by system of submersions, vegetation being too much diversified. At level of experimental farm station of Hassi ben Abdallah, presence of market gardening and adventitious vegetations has favoured rise of total richness value of orthopteras.

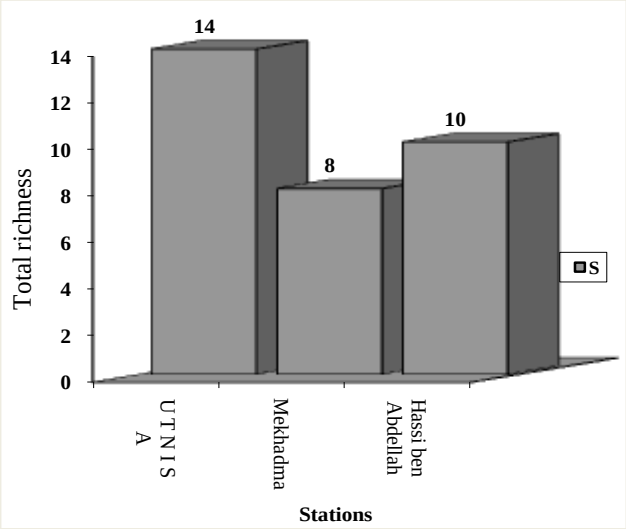

Figure 1: Total Richness of Orthopteras in Different Study Stations

The highest average richness concerning station of U T N I S A. is recorded during months of May and Jun with value of 3.8 species. The weaker value is noted in January with O.2 species. As for station of Mekhadma, the higher average richness of orthopterologic populating is noted during months of June and July with maximal value of 3.4 species, reached during the last quoted month. On the other hand, the weakest average richness is mentioned at the end of December month with 0.4 species, and in January where no specie has been quoted, and in the beginning of February month with 0.8 species. Absence or rarity of species during January and February is due to climatic factors. At level of

experimental farm station of Hassi Ben Abdallah, the highest average richnesses are noted during months of May and June with a maximum contributor during the last quoted month with an average richness of 3.4 species. Values variation of these average richnesses are due to microclimatic conditions, and to frequent trampling caused by workers activities (Table 2).

Table 2: Average Richness by Quadrate, by Goings-Out and by Species Number Station

Stations Dates	U T N I S A Sm	Mekhadma Sm	Hassi Ben Abdellah Sm
15-IX-01	2	1,6	2
30-IX-01	2,4	2,6	2,4
15-X-01	2,6	2,8	2,4
30-X-01	2,6	2	2,2
15-XI-01	2,6	2	1,8
30-XI-01	2,8	2	3
15-XII-01	2	1,8	2,2
30-XII-01	0,6	0,4	2
15-I-02	0,2	0	2
30-I-02	0,6	0	1,4
15-II-02	1,2	0,8	1,6
28-II-02	2,8	1,6	2,4
15-III-02	2,4	2	2,6
30-III-02	2,8	2,2	2
15-IV-02	2,8	2,2	1,6
30-IV-02	2,4	2	2
15-V-02	3,2	2,4	3,2
30-V-02	3,8	2,8	3,4
15-VI-02	3,8	2,8	3
30-VI-02	3,8	3,2	2,4
15-VII-02	3,4	3,2	2,8
30-VII-02	3	3,4	2,4
15-VIII-02	3,2	2,6	2
30-VIII-02	2,4	1,8	1,8

We can say at level of U T N I S A station, it is *Pyrgomorpha Cognata* specie which presents the most important centesimal frequency with 38.27% followed by *Duroniella lucasi* with 21.16%, *Acrotylus patruelis* with 13.43% and at last *Ochrilidia gracilis* with 11.28%.On the other hand, weakest values are recorded in *Schistocerca gregaria* with 0.12%, *Anacridium aegyptium* with 0,25 % and *Sphingonotus carinatus* with 0,25 %. Relating to traditional palm grove of Mekhadma, it is always, *Anacridium aegyptium* with 0.25% and *Sphingonotus carinatus* with 0,25 %.which show the highest frequency value with 25.99%. It is followed by *Duroniella lucasi* with 21,03 %, *Acrotylus patruelis* with 17,85 % and at last *Ochrilidia gracilis* with 14,68 %. Less important centesimal frequencies are noted for Ensifera *Gryllus bimaculatus*, and *Aiolopus strepens* specie avec 0,59 %. Within experimental farm station of Hassi ben Abdalah, maximal values of centesimal frequency concern *Acrotylus patruelis* with 38,83 %, followed by *Ochrilidia gracilis* with 29,55 % and of *Pyrgomorpha cognata* with 18,23 %..Less higher are pointed out for *Ochrilidia surcoufi* with 0.31% and *Sphingonotus carinatus* avec 0,62 %. *Pyrgomorpha cognata* and *Duroniella lucasi* species are the most frequent at level of palm groves. It seems that frequency is in relation with conditions offered by environment (Table 3)

Table 3: Annual Centesimal Frequencies of Orthopteras' Species in Different Stations of Ouargla Oasis in %

Species Stations	U T N I S A		Mekhadma		Hassi Ben Abdellah	
	Ni	F%	ni	F%	ni	F%
Gryllus bimaculatus	0	0	3	0,59	0	0
Gryllulus palmetorum	5	0,63	0	0	0	0
Pyrgomorpha cognata	302	38,27	131	25,99	116	18,23
Heteracris annulosus	4	0,50	0	0	0	0
Schistocera gregaria	1	0,12	0	0	0	0
Anacridium aegyptium	2	0,25	0	0	0	0
Acrida turrita	0	0	0	0	28	4,40
Aiolopus strepens	4	0,50	3	0,59	0	0
Aiolopus thalassinus	37	4,68	39	7,73	15	2,35
Duroniella lucasi	167	21,16	106	21,03	17	2,67
Acrotylus patruelis	106	13,43	90	17,85	247	38,83
Sphingonotus rubescens	2	0,25	0	0	0	0
Sphingonotus carinatus	2	0,25	0	0	4	0,62
Ochrilidia surcoufi	0	0	0	0	2	0,31
Ochrilidia gracilis	89	11,28	74	14,68	188	29,55
Ochrilidia kraussi	4	0,50	0	0	6	0,94
Truxalis nasuta	0	0	0	0	13	2,04
Paratettix meridionalis	64	8,11	58	11,50	0	0

As for U T N I S A station, it exists 5 constant species which are *Pyrgomorpha cognata, Aiolopus thalassinus, Duroniella lucasi, Ochrilidia gracilis* and *Paratettix meridionalis.* Higher values of constancy are observed with *Pyrgomorpha cognata* and *Duroniella lucasi* with 91,66 % and *Ochrilidia gracilis* with 79,66 %. For the same station accessory specie appears, it is about of *Acrotylus patruelis* with constancy value of 45.83%. Concerning station of Mekhadma, there are four constant species. These are *Pyrgomorpha cognata, Aiolopus thalassinus, Duroniella lucasi* and *Ochrilidia gracilis.* Two species are accessories with respective values of the constancy of 50% and 45.83%. As for experimental farm station of Hassi Ben Abdallah, three species are constant which are *Pyrgomorpha cognata, Acrotylus patruelis* and Ochrilidia *gracilis* with constancy values of respectfully 91, 66 %, 100 % and 100 %. Also we note three accessories species for the same stations which are *Acrida turrita* with 45, 83 %, *Duroniella lucasi* with 33, 33 % and *Truxalis nasuta* with 33, 33 %. Constancy of orthopterologic species varies from station to another. However, two species are constant for the three stations, there are *Pyrgomorpha cognata* and *Ochrilidia gracilis (*Table 4)

Table 4: Constancy of Orthopterologic Species in the Three Study Stations of Ouargla Oasis

Stations Species	U T N I S A		Mekhadma		Hassi Ben Abdellah	
	C%	Cl	C%	Cl	C%	Cl
Gryllulus Bimaculatus	0	-	8,83	A	0	-
Gryllulus palmetorum	12,5	A	0	-	0	-
Pyrgomorpha cognata	91,66	C	91,66	C	91,66	C
Heteracris annulosus	12,5	A	0	-	0	-
Schistocerca gregaria	4,16	A	0	-	0	-
Anacridium aegyptium	8,33	A	0	-	0	_
Acrida turrita	0	-	0	-	45,83	AC
Aiolopus strepens	12,5	A	12,5	A	0	-
Aiolopus Thalassinus	54,16	C	58,33	C	20,83	A
Duroniella lucasi	91,66	C	83,83	C	33,33	AC
Acrotylus patruelis	45,83	AC	50	AC	100	C
Sphingonotus rubescens	8,33	A	0	-	0	-

Table 4 : Contd.,

Sphingonotus carinatus	**4,16**	A	0	-	4,16	A
Ochrilidia surcoufi	0	-	0	-	8,33	A
Ochrilidia gracilis	79,16	C	66,66	C	100	C
Ochrilidia kraussi	16,66	A	0	-	16,66	A
Truxalis nasuta	0	-	0	-	33,33	AC
Paratettix meridionalis	66,66	C	45,83	AC	0	-

% : Constancy en % **AC.** : Accessories Species
C : Constant Species - : Absent Species
Cl: Class **A**: Accidental Species

Diversity index H' of Orthopterologic populating living in palm grove of U T N I S A. varies between 1.16 bits in March and 1.55 bits in April. 8 species are counted during this month on total of 14 which is 57.14%. We have pointed out presence of *Anacridium aegyptium* specie which is sampled only during April and February and so for *Aiolopus strepens* specie captured during October April and on beginning of May. We have to note that the most important diversity in this station is pronounced in April and August, during that period, temperatures begin to raise, which advantages pullulating of Orthopteras. At level of Mekhadma station, index values of diversity oscillate between 0.97 bits in February and 1.66 bits in June. 6 species are counted during this month on a total of 8 which is 75%. In January month, no specie has been sampled. However, February month, where H' takes its value the weakest of 0.97 bits, we can explain that by environmental conditions which are unfavourable to Acrididaes' development. In effect, temperatures are very low during this period. 4 species are present: it is about *Pyrgomorpha cognata, Duroniella lucasi, Ochrilidia gracilis* and *Paratettix meridionalis*. As for experimental farm station of Hassi Ben Abdallah, the higher diversity indexes are noted in months of May, September and October with respectfully 1.58 bits, 1.49 bits and 1.47 bits. 8 species are counted in May on a total of 10 which is 80% where in September and October, 6 species were captured on a total of 10 which is 60%. The weakest value was recorded on April which is1 bit (Table 5).

Table 5: Diversity Index of Shannon-Weaver of Orthopteras Species in the Three Studies Stations of Ouargla Oasis

Stations Year Month		Diversity Index H 'in Bits		
		U T N I S A	Mekhadma	Hassi Ben Abdellah
2001	IX	1,21	1,21	1,49
	X	1,24	1,54	1,47
	XI	1,36	1,52	1,37
	XII	1,24	1,22	1,25
2002	I	1,32	-	1,21
	II	1,36	0,97	1,32
	III	1,16	1,52	1,07
	IV	1,55	1,18	1,00
	V	1,45	1,39	1,58
	VI	1,42	1,66	1,25
	VII	1,47	1,62	1,29
	VIII	1,44	1,36	1,32

-: Absent Species

Equitability values concerning station of U T N I S A. oscillate between 0.62 in September and 0.95 in January. As for station of Mekhadma, equitability values vary between 0.70 in February and 0.98 in August. For that reason, found populations are equitably spread. We note that equitability has not been calculated for month of January, because no specie

exists. As for station of experimental farm of Hassi ben Abdallah, equitability values are all above to 0.55 with maximal value of 0.85 pronounced during November (Table 6)

Table 6: Equitability of Orthopteras Species in the Three Studies Stations of Ouargla Oasis

Stations Year Month		Equitability (E)		
		U T N I S A	Mekhadma	Hassi Ben Abdellah
2001	IX	0,62	0,87	0,83
	X	0,77	0,86	0,82
	XI	0,75	0,84	0,85
	XII	0,89	0,88	0,78
2002	I	0,95	-	0,75
	II	0,75	0,70	0,82
	III	0,84	0,95	0,59
	IV	0,74	0,73	0,55
	V	0,74	0,86	0,76
	VI	0,68	0,92	0,69
	VII	0,71	0,83	0,72
	VIII	0,69	0,98	0,82

-: Absent Species

Spatial distribution of Orthopteras differs from specie to another and from station to the other. In station of U T N I S A., majority of species have a contagious distribution on nearly along the year. We quote *Pyrgomorpha cognata*, *Acrotylus patruelis Aiolopus thalassinus, Duroniella lucasi and Paratettix meridionalis*. *Ochrilidia gracilis* specie presents a regular distribution during autumnal season and a contagious distribution during remaining year. *Schistocerca gregaria* specie has distribution of random type during February. This specie has been sampled once and in only one individual. *Anacridium aegyptium* specie presents this random distribution during February and April. At level of Mekhadma station, *Pyrgomorpha cognata*, Ochrilidia *gracilis, Acrotylus patruelis*, Aiolopus *thalassinus, Duroniella lucasi* and *Paratettix meridionalis* present a contagious distribution nearly all of the year Individuals of *Paratettix meridionalis* specie prefer damp spots, for that reason they gather around in aggregate in front of brook stream. *Aiolopus strepens* specie shows a random distribution during months of October, November and July. This specie exists with very weak individuals' number. Ensifera Gryllus bimaculatus has distribution of contagious type during October, in spite of individual's number which is very weak, because it has been sampled in the same quadrant. At level of experimental farm of Hassi Ben Abdallah *Pyrgomorpha cognata* and *Ochrilidia gracilis* show distribution of contagious type nearly along the year. On the other hand, *Acrotylus patruelis* presents regular distribution during May and June, remaining of the year; its distribution is either regular or contagious. *Ochrilidia surcoufi* specie has a random distribution in September and May, this acrididae has been sampled twice only during our study. Moreover *Sphingonotus carinatus* specie possesses contagious dispersal in August **(**Table 7.8.9).

Table 7: Distribution Type of Orthopteras in Station of U T N I S A

	2001								2002																
Sampling Date / Species	IX	IX	X	X	XI	XI	XII	XII	I	I	II	II	III	III	IV	IV	V	V	VI	VI	VII	VII	VIII	VIII	VIII
G. Palmetorum	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	A	R	R	/	/	/	/	/	
P. cognate	C	R	C	R	C	R	C	/	/	C	R	R	C	C	C	A	R	C	C	C	C	C	C	R	R
H.annulosus	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	A	R	/	/	/	A	A
S. gregaria	/	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	/	/	/	/	/
A. aegyptium	/	/	/	/	/	/	/	/	/	/	/	A	/	/	A	/	/	/	/	/	/	/	/	/	/
A. strepens	/	/	/	A	/	/	/	/	/	/	/	/	/	/	/	A	C	/	/	/	/	/	/	/	/

Table 7: Contd.,

A. thalassinus	/	A	C	C	R	/	/	/	/	/	/	/	/	A	C	A	C	C	R	C	C	A	/	/	
D. lucasi	/	C	R	A	R	C	R	R	/	C	R	R	R	C	C	C	C	C	R	C	C	A	A	C	
A. patruelis	A	/	/	/	/	/	/	/	/	/	/	/	/	/	C	A	C	C	C	C	C	C	C	C	C
S. rubescens	A	/	/	/	A	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
S. carinatus	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	C	/	/	/	/
O. gracilis	R	R	R	R	R	R	C	A	C	/	/	C	C	C	/	C	/	/	A	C	C	C	C	C	C	C	C
O. kraussi	A	A	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	A	/	A	/	/	A	/
P. meridinalis	/	/	/	/	/	C	C	R	/	A	C	C	C	C	C	R	C	C	C	C	C	A	A	/	/	A	

Table 8: Distribution Type of Orthopteras in Station of Mekhadma

	2001								2002																
Sampling Date *Species*	**IX**	**IX**	**X**	**X**	**XI**	**XI**	**XII**	**XII**	**I**	**I**	**II**	**II**	**III**	**III**	**IV**	**IV**	**V**	**V**	**VI**	**VI**	**VII**	**VII**	**VIII**	**VIII**	**VII I**
G. bimaculatus	/	/	A	C	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
P. cognate	R	R	C	A	R	C	R	A	/	/	R	C	R	A	R	A	C	C	C	C	C	C	C	C	C
A. strepens	/	/	A	/	A	/	/	/	/	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/
A.thalassinus	/	R	A	R	C	A	C	A	/	/	/	/	/	/	/	C	C	A	C	C	C	C	/	/	/
D.lucasi	R	C	R	C	C	R	A	/	/	/	/	C	C	R	R	C	C	C	C	C	C	C	C	C	C
A.patruelis	/	/	/	/	/	/	/	/	/	/	/	/	A	C	C	C	C	R	R	R	C	C	C	A	A
O. gracilis	C	R	R	C	C	R	C	/	/	/	/	A	C	A	/	R	/	/	/	C	C	C	C	C	C
P. meridionalis	/	/	/	/	/	C	/	/	/	/	R	C	R	A	/	/	C	C	C	C	C	R	/	/	/

R: Regular C: Contagious A: Aleatory /: Absent Species

Table 9: Distribution Type of Orthopteras in Station of Hassi Ben Abdallah

	2001								2002																
Sampling Date *Species*	**IX**	**IX**	**X**	**X**	**XI**	**XI**	**XII**	**XII**	**I**	**I**	**II**	**II**	**III**	**III**	**IV**	**IV**	**V**	**V**		**VI**	**VII**	**VII**	**VIII**	**VIII**	**VII I**
P.cognata	C	C	C	R	R	A	R	R	C	/	C	C	R	C	C	/	A	C	C	C	C	C	C	R	R
A.tunita	A	C	R	R	A	R	A	/	A	/	/	C	A	/	/	C	/	C	C	/	C	/	/	/	/
A.thalassinus	/	/	A	/	/	/	/	/	/	/	/	/	/	/	/	/	C	R	C	/	R	/	/	/	/
D.lucasi	/	/	/	/	A	/	/	/	A	R	R	/	/	A	/	A	C	/	/	/	/	R	/	/	
A.patruelis	C	A	C	R	C	A	R	R	A	A	C	A	R	C	C	C	R	R	R	R	C	C	C	R	R
S.carinatus	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	C	C
O.surcoufi	/	A	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	A	/	/	/	/	/	/	
O.gracilis	C	C	C	R	C	R	C	C	R	A	C	R	C	C	C	C	C	C	C	C	A	C	C	C	C
O.kraussi	/	/	/	/	/	/	/	A	/	/	/	/	/	/	/	/	C	/	/	A	/	/	A	/	/
T. .nasuta	C	A	A	/	/	/	/	/	/	/	/	/	C	R	C	C	/	/	/	/	/	/	/	/	/

R: Regular C: Contagious A: Aleatory /: Absent Species

In factorial analysis of correspondences, we have taken in consideration 18 variables which corresponding each one to Orthopteras specie met during our sampling and 3 observations which correspond to stations' study. This analyse helps to describe existing relation between Orthopteras species and station on the one hand and species between them on the other hand. We deduct that the three stations are found in different quadrates. If we consider the whole of Orthopteras species on definite plan by axes 1 and 2, we note 6 groupings.

Grouping (A) contains species which are present at level of the three study's stations, It is about of *Pyrgomorpha cognata* (PCO),*Aiolopus thalassinus* (ATH),*Duroniella lucasi* (DLU) *Acrotylus patruelis* (APA) and *Ochrilidia gracilis* (OGR). These species can frequent different biotopes. Grouping (B) contains species which are present only in station of U T N I SA. This is the case of Gryllulus *palmetorum* (GPA), *Heteracris annulosus* (HAN), *Schistocerca gregaria* (SGR), *Anacridim aegyptium* (AAE) and *Sphingonotus rubescens* (SRU). These species characterize the palm grove for we have

found them only at this level. Grouping (C) represents species which are noted only at level of station of Hassi ben Abdallah. These are *Ochrilidia surcoufi* (OSU), *Acrida turrita* (ATU) and *Truxalis nasuta* (TNA). Grouping (D) contains two species *Sphingonotus carinatus* (SCA) *and Ochrilidia kraussi (*OKR). These two Acrididaes belong at the time to station of UTNISA and to experimental farm of Hassi Ben Abdallah. Grouping E On the other hand, presents two species *Aiolopus strepens* (AST) and *Paratettix meridionalis* (PME) pointed out at level of both palm groves, of U T N I S A and of Mekhadma. Grouping F At last it is constituted by only one specie *Gryllus bimaculatus* (GBI) which is found only at level of palm grove of Mekhadma Figure 2 (Annexe 1).

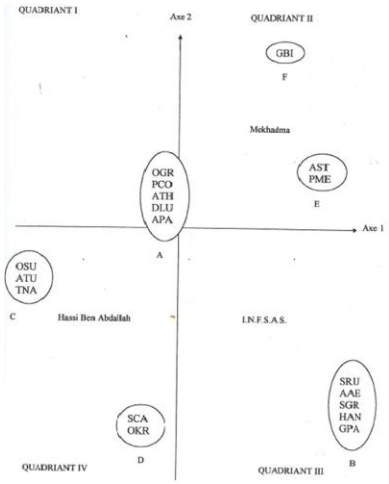

Figure 2: Factorial Card Containing Axes (1-2) of Orthopteras Species

Annexe 1: Presence or Absence of Orthopteras Species with (Their Abbreviations) in Study Stations of Ouargla Oasis

Espèces	Abréviations	U T N I S A	Mekhadma	Hassi Ben Abdellah
Gryllus bimaculatus	GBI	-	+	-
Gryllulus palmetorum	GPA	+	-	-
Pyrgomorpha cognata	PCO	+	+	+
Heteracris annulosus	HAN	+	-	-
Schistocerca gregaria	SGR	+	-	-
Anacrydium aegyptium	AAE	+	-	-
Acrida turrita	ATU	-	-	+
Aiolopus strepens	AST	+	+	-
Aiolopus thalassinus	ATH	+	+	+
Duroniella lucasi	DLU	+	+	+
Acrotylus patruelis	APA	+	+	+
Sphingonotus rubescens	SRU	+	-	-
Sphingonotus corinatus	SCA	+	-	+
Orchrilidia surcoufi	OSU	-	-	+
Ochrilidia gracilis	OGR	+	+	+
Ochrilidia kraussi	OKR	+	-	+
Truxalis nasuta	TNA	-	-	+
Paratettix meridionalis	PME	+	+	-

+: Species Present

-: Absent Species

DISCUSSIONS

Inventory of Orthopterologic fauna of Ouargla oasis shows presence of 18 species where 16 Caelifera and 2 Ensifera. The acrididae family is the richest with 14 species. We found upon classification given by LOUVEAUX and BEN HALIMA (‘1987) for Caelifera and this of CHOPARD (1943) for Ensifera. DOUMANDJI – MITICHE and al (1999) point out presence of 25 orthopteras species in oasis of Bechar, 11 at Adrar and 10 at Tamenrasset Acrididae family is mostly represented. We point out that 5 Caelifera species are common to the three stations. Others species are present only in station of Hassi Ben Abdallah; It is about of *Acrida* turrita, *Ochrilidia surcouffi* and *Acridella nasuta*. *Paratettix meridionalis* specie prefers damp spots, which explains its presence at level of palm groves. According to CHOPARD (1951), *Paratettix meridionalis* is very common in damp spots and the side of streams. We have to remind that LOUVEAUX and BEN HALIMA (1987) quoted 140 Caelifera species for all Algeria. In this case with 16 species, region of Ouargla shelters qualitatively 11.42% of Algerian orthopteras-fauna.

Total richness varies according to stations and sampling periods. DOUMANDJI – MITICHE and al (1993) underline presence of 27 species in Biskra Oasis, where 13 species in palm grove of Oumache and 15 species in this of Ourlal. Yes, BELHADJ (2013) noted presence of 10 Caelifera species in Bou Saada Oasis with 8 species present in cereal plot.

Average richness values relating to U T N I S A vary between 0.2 in January and 3.8 species in June. As for station of Mekhadma, average richness values fluctuate between 0 in January and 3.4 species during July. Absence or rarity of species in January and February is due to climatic factors. At last, concerning experimental farm of Hassi Ben Abdellah, values oscillate between 1.4 in January and 3.4 species in May. Values variation of these average richnesses for the last quoted station is due to microclimatic conditions and to trampling frequency of workers activities. We have to note that BENMADANI and al (2011) note that the higher value of average richness is 1.5 relating to station of Faid el Bolma and El Mesrane in semi-arid zone.

Pyrgomorpha cognata and Duroniella *lucasi* species are the most frequent at level of palm groves. Concerning the cultivated field of experimental farm of Hassi ben Abdallah, it is *Acrotylus patruelis* specie which presents the higher centesimal frequency with 38.83% followed by *Ochrilidia gracilis* with 29,55%. According to CHOPARD (1943) arid and semi-arid biotopes constitute preferred environment to *Pyrgomorpha cognata*. In the same way, LAUNOIS and LECOQ (1989).note that specie is very movable, it moves according seasons between different regions of its habitat area, according to ecologic conditions evolution.. Likewise, OULD EL HADJ (2002) notes that frequency and pullulating of *Pyrgomorpha cognata* and *Acrotylus patruelis* species worry often farmers in region of Ouargla.

Constancy of orthopterologic species varies from station to another. However, two species are constant for the three stations, these are *Pyrgomorpha cognata* and *Ochrilidia gracilis*, out of climatic conditions, it is particularly saltness, by its degree which manages constancy of species in basin of Ouargla. DOUMANDJI and DOUMANDJI – MITICHE (1992) think that higher number of accidental species in cultivated station is probably due to disturbances caused by agricultural activities.

The higher diversity index relating to station of U T N I S A was observed in April with 1.55 bits. According to VIERA DA SILVA (1979) and BLONDEL (1949), a community is all the more diversified that index H’ will be larger. As for station of Mekhadma, maximal value is situated to June with 1.66 bits. Absence of Orthopteras species during wintery season probably translates life conditions enough unfavourable. Concerning station of experimental farm of Hassi ben

Abdallah, diversity index oscillates between 1.58 bits in May and 1.00 bit in April. According to DAJOZ (1971), diversity is under condition of two factors:

Environment stability, and Climatic. According to BENMADANI and al (2011), diversity values enough high translate a large diversity of Orthopterologic fauna in semi arid zone in region of Djelfa.

As for Station of U T N I S A, equitability values vary between 0.62 in September and 0.95 in January. We can say that environment is stable and species are in balance between them. Concerning Station of Mekhadma, equitability values vary between 0.70 in February and 0.98 in August. For that reason, found populations are fairly spread. Relating to experimental farm of Hassi ben Abdallah, equitability values are all above 0.55 with maximal value of 0.85 pronounced during November. These values translate balance between found populations at level of this station. Likewise, BENHARZALLAH (2011) reveals that calculated equitability for semi-cultivated station represented by region of Barika is of 0.90, when at level of meadow station it is of 0.80.. According to FRONTIER (1982), a community containing a small number of species enough very abundant, others rare, appears less diversified than community having in total the same number of species but with frequencies fairly more spread.

Three types of spatial distribution characterize Orthopteras existing in our three study stations. However, contagious distribution is the most characteristic, Species which have weak population show distribution of random type of their individuals. According to GHENDOUZ–BENRIMA and al (2002) by their nourishing character, plants play a determined role in spatial distribution of vegetarian animal species. In the same way, KUNELT (1969) noted that various societies constituted by organisms of any orders determine irregularity of spatial distribution in spots even where available area totality would suit as a vital environment by these species. DAJOZ (1985) specifies that grouping of population's individuals is often the event of varied behaviour such as defence against predators, protection against cold, wind and looking for food. Works of KARA and al (2001), in five regions of Algerian South which are: Bechar, Adrar, Tamanrasset, Djanet and Ghardaia show that species number of Orthopteras varies qualitatively and quantitatively according to study regions. Effectively, this number passes to 38 at Ghardaia to 25 at Bechar, 12 at Djanet, 11 at Adrar and at last 10 at Tamanrasset.

Through factorial analysis of correspondences, we have noted that Orthopterologic species are spreading according their ecologic affinities. Through plan definite by the 2 axes, we have considered 6 groupings. Floristic composition of study' environment is an important factor in formation of these groupings.

Likewise, human intervention by these different activities may cause modifications of Orthopteras-fauna of our study's regions. According BRAQUE-BOURAGBA (2007), variations between stations and years may be due either to changes that environment have sustained or to climatic conditions particularly rain-gauge and temperatures which would cause changes of vegetable covering, and thus of trophic resources.

CONCLUSIONS

In Oasis of Ouargla, situated in northern Sahara, where aridity is expressed not only by higher temperatures in summer but also by weakness of precipitations. Inventory of Orthopterologic fauna of this region in the three stations, allowed us to inventory 18 species. Number species varies from station to another according microclimatic conditions and vegetable covering. Through this study, we have been able to treat some data on locusts which can cause damages to

Saharian agriculture. However, it would be interesting to reach others aspects which are: systematic of some species and so bio-ecology of the main species present in this region.

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